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## Assessment of knowledge concerning urology among medical students in Poland

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**Abstract:** Background and objective: Urological diseases represent a significant health issue worldwide. Presented study aimed at assessing current urological knowledge and confidence in performing urological diagnostic and therapeutic procedures among medical students at Jagiellonian University Medical College in Poland and compare it on different stages of the undergraduate medical education.

**Material and methods:** We designed an anonymous survey distributed among Polish students from 1<sup>st</sup> to 6<sup>th</sup> year of medical studies, before and after clinical urology course. Questions concerned general urological knowledge, prostate diseases, erectile dysfunction, and self-reported practical urological skills.

**Results:** Overall, 437 respondents participated in the survey. Mean total test score in our study group was 50.08%, mean general urological knowledge score was 53.44%, mean prostate diseases knowledge score was 55.43%, mean erectile dysfunction score was 36% and mean practical skills score was 45.83%. Mean total test score increased with consecutive years of studies ( $R = 0.58$ ;  $p < 0.001$ ). The risk of an above average total test score was significantly influenced by the urology course ( $OR = 7.95$ , 95%CI = 1.81–34.84,  $p = 0.006$ ) and the year of medical studies (4<sup>th</sup>–6<sup>th</sup> vs. 1<sup>st</sup>–3<sup>rd</sup>) ( $OR = 5.16$ , 95%CI = 3.41–7.81,  $p < 0.001$ ). Practical skills score above average was significantly more frequent in the group after the urology course ( $OR = 6.75$ , 95%CI = 1.54–29.58,  $p = 0.011$ ).

**Conclusions:** Results of this study reveal low mean scores obtained by students, even after completing the urology course, which implies that curriculum requires further development. Urological knowledge and self-assessed practical skills increased with years of medical education. The urology course improved the score obtained in our survey, both in terms of total test score and practical skills.

**Key words:** urology, knowledge, medical students, survey.

## Introduction

Urological diseases are increasing in significance worldwide. Incidence of urological cancers continues to have significant impact on population's mortality [1]. For instance, prostate cancer is the third most common cause of death from cancer in men [2]. Prevalence of non-oncological urological disorders such as erectile dysfunction (ED) and urolithiasis increases over time due to improvements in clinical-diagnostic procedures, changes in nutritional or environmental factors and increased lifespan constituted by the development of Western civilization [3, 4]. Wide range of urological disorders and constant improvement of the quality of care can put an immense burden on healthcare system [5]. Several previous studies estimated that genitourinary conditions can cause up to 10% of General Practitioner visits, which implies that basic urological knowledge should be included in course of general medical education [6, 7]. Both theoretical and clinical teaching of urology is necessary and feasible during medical education; however, it is important to evaluate current curriculum and assess changes in students' knowledge during their education.

## Aim of the study

The objective was to assess the current knowledge concerning urology and confidence in performing urological diagnostic and therapeutic procedures among medical students at Jagiellonian University Medical College in Poland. We also aimed to compare it between different stages of the undergraduate medical education.

## Material and methods

This study included an anonymous survey distributed among Polish students from 1<sup>st</sup> to 6<sup>th</sup> year of medical studies at Jagiellonian University Medical College in Cracow, Poland, in December 2015. Survey including questions on various clinical subjects and self-assessed practical skills principal in urology, was designed by academic teachers, directly involved in education of medical students in the field of urology. Questionnaires were distributed by authors as a printed form to students who previously could not have been acquainted with the questions. Inclusion criteria: informed consent to participate in the study and current status of a medical student at Jagiellonian University Medical College (Medical Doctor program). Exclusion criteria included: lack of fluency in the Polish medical language, discontinuation of the completion of the survey and not self-reliant completion of the survey. The calculated survey sample size for a population of medical students at Jagiellonian University Medical College with confidence level of 95% and 5% margin of error was 339.

The urology course at Jagiellonian University Medical College took place during 6<sup>th</sup> year. It included 20 hours of practical clinical training and 10 hours of theoretical seminars. The course covered history taking, urological examination, diagnosis and treatment of common urological disorders.

Survey comprised 21 yes/no questions and 8 multiple choice/multiple answer questions. Questionnaire included 2 questions (Q) characterizing study group (Q1 — year of medical school and Q2 — passing the urology course) and 27 questions concerning urology. Q3–5 focused on general urological knowledge. Q6–7 focused on testicular cancer. In Q8–9 students were asked about urination disorders. Hematuria cases were presented in Q10–11. Q12–18 assessed theoretical knowledge of symptoms and diagnosis of prostate diseases. Information concerning erectile dysfunction was obtained in Q19–21. Students' practical skills useful in urology (i.e., bladder catheterization, self-catheterization, digital rectal examination, testicular examination, and testicular self-examination) were evaluated in Q22–27. Q28 asked students whether they should have more class hours devoted to urology and Q29 assessed students' interest in urology as their future specialty. Complete questionnaire is available in Appendix 1. Questionnaire has not been validated.

For practical reasons, we grouped questions concerning urological knowledge into 4 groups: Q3–11 — general urological knowledge (maximal score = 9), Q12–18 — prostate diseases (maximal score = 7), Q19–21 — erectile dysfunction, and Q22–27 — practical urological skills (maximal score = 6).

The primary endpoint was to assess students' basic urological knowledge and self-reported practical skills involved in urological care and compare it on different stages of medical education.

All data was analyzed using SPSS for MacOs version 21.0 (SPSS Inc., Chicago, IL, USA). P-value <0.05 was considered statistically significant. The results are presented as a number, percentage and mean with standard deviation (SD). Spearman's Test of Linear Correlation was used to determine the correlation between the test score and years of the medical studies. Influence of the urology course and influence of the year of medical studies (4<sup>th</sup>–6<sup>th</sup> vs. 1<sup>st</sup>–3<sup>rd</sup>) on score obtained in the survey was analysed using univariate logistic regression model. Sample size was calculated using Sample Size Calculator (Raosoft, Inc., Seattle, WA, USA).

The study has been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

## Results

Overall, 437 respondents participated in the survey. Study group characteristics are presented in Table 1.

**Table 1.** Study group characteristics (Question 1&2).

–	n	%
Total	437	100.00
1 <sup>st</sup> year medical students	52	11.90
2 <sup>nd</sup> year medical students	35	8.01
3 <sup>rd</sup> year medical students	89	20.37
5 <sup>th</sup> year medical students	87	19.91
6 <sup>th</sup> year medical students (before the urology course)	78	17.85
6 <sup>th</sup> year medical students (after the urology course)	19	4.35

Results for individual questions are presented in Table 2. Majority (89.24%) of respondents indicated that urologist performs surgery (Q3), and 74.6% stated that urologist does not deal with dialysis (Q4). Questions which gathered high rate (>70%) of correct responses were those covering testicular cancer (Q6–7), prostate nomenclature (Q5), and DRE / PSA (Q12–14,17; except the PSA case in Q15–16). Questions with less than 50% of correct responses included those regarding overactive bladder (Q8), urodynamics (Q9), hormone therapy in prostate cancer (Q18) and ED case (Q20), with particularly low results (<10%) obtained for hematuria cases (Q10,11) and ED in a young male (Q19).

**Table 2.** Summary of the results.

Question nr	Category	Brief description	Number of correct responses	%
3	General urological knowledge	Urologist as a surgeon	390	89.24
4		Urologist does not perform dialysis	326	74.60
5		Prostate nomenclature	419	95.88
6		Testicular cancer	386	88.33
7			369	84.44
8		Overactive bladder	217	49.66
9		Urodynamics	161	36.84
10		Hematuria cases	10	2.29
11			39	8.92
12	Prostate diseases	DRE	411	94.05
13			352	80.55

Table 2. Cont.

Question nr	Category	Brief description	Number of correct responses	%
14	Prostate diseases	PSA	318	72.77
15		PSA case	277	63.39
16			206	47.14
17		DRE and PSA	404	92.45
18		Hormone therapy	100	22.88
19	Erectile dysfunction	ED Cases	29	6.64
20			205	46.91
21		ED Causes	237	54.23
22	Practical urological skills	Catheterization female	237	54.23
23		Catheterization male	231	52.86
24		DRE	277	63.39
25		Testicular exam	181	41.42
26		Explain testicular self-exam	176	40.27
27		Self-catheterization	98	22.43
28	Other	Urology class hours	187	42.79
29		Urology as future choice	172	39.36

Concerning self-reported practical skills, 54.23% of respondents claimed ability to perform bladder catheterization in female (Q22) and 52.86% in male (Q23), while 72.77% claimed ability to perform digital rectal examination (Q24). Overall, 41.42% of respondents know how to perform testicular examination (Q25) and 40.27% can explain to the patient how to perform testicular self-examination (Q26). Knowledge regarding self-catheterization was claimed by 22.43% of respondents (Q27).

Notably, only 42.79% of students stated that current medical school curriculum include sufficient amount of class hours dedicated to urology (Q28). Overall, 9.38% of respondents considers urology as a possible future specialty (Q29).

Score results are presented in Table 3 and Figure 1. Mean total test score and mean score in questions concerning general urological knowledge significantly increased with subsequent years of medical school ( $R = 0.58$ ;  $p < 0.001$  and  $R = 0.469$ ;  $p < 0.001$ ). Students' level of prostate disease knowledge also increased consecutively with years of studies; however, students of the 6<sup>th</sup> year of medical school before the urology course managed to achieve higher prostate diseases score than students after completing

Table 3. Correlation between the knowledge concerning urology between students and different stages of their undergraduate medical education.

	Total group	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year	5 <sup>th</sup> year	6 <sup>th</sup> year (before the urology course)	6 <sup>th</sup> year (after the urology course)	R	p
Mean total test score (max = 25) (n ± SD), %	12.52 ± 3.24 (50.08%)	8.31 ± 2.43 (33.24%)	8.6 ± 2.52 (34.4%)	12.87 ± 2.51 (51.48%)	12.48 ± 2.52 (49.92%)	14.09 ± 2.23 (56.36%)	14.28 ± 2.41 (57.12%)	15.32 ± 2.08 (61.28%)	0.58	<0.001
Mean general urological knowledge score (max = 9) (n ± SD), %	4.81 ± 1.27 (53.44%)	4.02 ± 1.34 (44.67%)	3.6 ± 1.27 (40%)	4.65 ± 1.11 (51.67%)	4.73 ± 1.02 (52.56%)	5.09 ± 1.1 (56.56%)	5.54 ± 1.13 (61.56%)	5.95 ± 0.848 (66.11%)	0.47	<0.001
Mean prostate diseases score (max = 7) (n ± SD), %	3.88 ± 1.26 (55.43%)	2.77 ± 1.25 (39.57%)	3.4 ± 1.12 (48.57%)	3.71 ± 1.34 (53%)	3.95 ± 1.13 (56.43%)	4.35 ± 1.17 (62.14%)	4.4 ± 0.96 (62.86%)	4.16 ± 1 (59.43%)	0.38	<0.001
Mean erectile dysfunction score (max = 3) (n ± SD), %	1.08 ± 0.73 (36%)	0.54 ± 0.58 (18%)	0.46 ± 0.56 (15.33%)	1.12 ± 0.74 (37.33%)	1.12 ± 0.73 (37.33%)	1.17 ± 0.69 (39%)	1.44 ± 0.66 (48%)	1.42 ± 0.51 (47.33%)	0.43	<0.001
Mean practical skills score (max = 6) (n ± SD), %	2.75 ± 1.77 (45.83%)	0.96 ± 1.4 (16%)	1.14 ± 1.29 (19%)	3.38 ± 1.43 (56.33%)	2.69 ± 1.67 (44.83%)	3.48 ± 1.58 (58%)	2.91 ± 1.65 (48.5%)	3.8 ± 1.4 (63.33%)	0.35	<0.001

urology course ( $R = 0.38$ ;  $p < 0.001$ ). We also observed statistically significant increase in knowledge about erectile dysfunction ( $R = 0.43$ ;  $p < 0.001$ ). Practical skills fluctuated between students during different years of medical education, but were significantly improved by urology course ( $R = 0.35$ ;  $p < 0.001$ ).

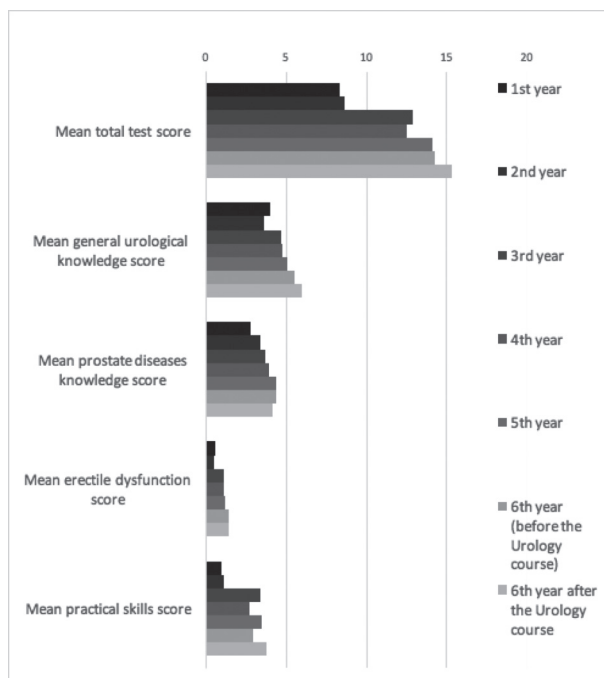


Fig. 1. Comparison of knowledge concerning urology between students during different stages of their undergraduate medical education.

The incidence of an above average total test score and general urological knowledge score was significantly increased by the urology course ( $OR = 7.95$ ,  $95\%CI = 1.81-34.84$ ,  $p = 0.006$  and  $OR = 5.66$ ,  $95\%CI = 1.29-24.8$ ,  $p = 0.022$ , respectively). Urology course did not increase the risk of an above average score in questions concerning prostate diseases or erectile dysfunction. Practical skills score was above average more commonly among students after the urology course ( $OR = 6.75$ ,  $95\%CI = 1.54-29.58$ ,  $p = 0.011$ ) (Table 4).

The year of medical studies ( $4^{th}-6^{th}$  vs.  $1^{st}-3^{rd}$ ) increased the incidence of an above average total test score ( $OR = 5.16$ ,  $95\%CI = 3.41-7.81$ ,  $p < 0.001$ ), general urological knowledge score ( $OR = 3.09$ ,  $95\%CI = 2.07-4.62$ ,  $p < 0.001$ ), prostate diseases score ( $OR = 3.19$ ,  $95\%CI = 2.13-4.78$ ,  $p < 0.001$ ), erectile dysfunction score ( $OR = 2.42$ ,  $95\%CI = 1.52-3.85$ ,  $p < 0.001$ ) and practical skills score ( $OR = 2.24$ ,  $95\%CI = 1.52-3.31$ ,  $p < 0.001$ ) (Table 5).

**Table 4.** Univariate logistic regression analysis of the influence of the urology course on score obtained in the survey.

Parameter (score above average vs. below average)	OR	95% CI	p value
Total test	7.95	1.81–34.84	<b>0.006</b>
General urological knowledge	5.66	1.29–24.8	<b>0.022</b>
Prostate diseases	3.31	0.95–11.53	0.061
Erectile dysfunction	1.99	0.78–5.07	0.151
Practical skills	6.75	1.54–29.58	<b>0.011</b>

**Table 5.** Univariate logistic regression analysis of the influence of the year of medical studies (4<sup>th</sup>–6<sup>th</sup> vs. 1<sup>st</sup>–3<sup>rd</sup>) on score obtained in the survey.

Parameter (score above average vs. below average)	OR	95% CI	p value
Total test	5.16	3.41–7.81	<b>&lt;0.001</b>
General urological knowledge	3.09	2.07–4.62	<b>&lt;0.001</b>
Prostate diseases	3.19	2.13–4.78	<b>&lt;0.001</b>
Erectile dysfunction	2.42	1.52–3.85	<b>&lt;0.001</b>
Practical skills score	2.24	1.52–3.31	<b>&lt;0.001</b>

## Discussion

Questionnaires are widely used for assessing knowledge and awareness concerning medicine. Participants in this sort of research are often students, physicians or specialists, but also patients undergoing certain type of treatment [8–12]. This study, designed to assess students' urological knowledge, fits in this trend and might become a motivating factor for the medical educators to broaden curriculums in this discipline.

Urology is one of the most desired specialization among Polish young physicians. Number of medical graduates wanting to pursue their career in urology is approximately two times higher than number of available urology training spots in Poland [13]. Almost every tenth student participating in our survey considers urology for potential future career choice. Nevertheless, majority of medical students are going to become primary care physicians, but their daily practice will also require basic urological knowledge and skills. Crucial urological knowledge for General Practitioner revolves around symptoms, diagnosing diseases and simple procedures, rather than being proficient in staging and complex urological treatment [7]. Poland



needs to meet medical demands of developed countries, i.e. managing disorders characteristic for this type of population, which are inter alia common urological diseases, e.g. prostate cancer or erectile dysfunction. Most students participating in the study (57.21%) declared that more class hours should be devoted to urology course, suggesting the need for more comprehensive urological course.

We did not find in literature any research comparable to the presented study conducted in Poland. Outcomes of a survey evaluating urological knowledge among attendings, residents, fellows, and clinical medical students at Stony Brook University Medical Center proved it is insufficient, which has a significant potential impact on patient care [14]. Low mean total test score in our study group and low mean general urological knowledge score, even among students after completing urology course, suggest that knowledge in this field among students in Poland might be insufficient. Students who participated in our survey achieved also low score in questions concerning prostate diseases. In a study on medical students' knowledge concerning screening for prostate cancer, authors concluded that training in prostate cancer screening may take place during a time when medical students do not feel these abilities will be relevant for their future practice [15]. Erueti *et al.* published interesting study in which students were asked to classify certain medical conditions as diseases or non-diseases. Only 45% of respondents classified erectile dysfunction as a disease which is consistent with our results presenting low mean score in knowledge concerning erectile dysfunction of  $1.08 \pm 0.73$  on a 3-point scale [16]. Results of a survey published by Lawrentschuk and Bolton from University of Melbourne showed that final year medical students had been taught digital rectal examination, but they did not have an opportunity to practice the technique on patients [17]. Previous studies suggest that supervised digital rectal examination should be absolute minimum requirement for medical students and majority of them agrees with that statement [18, 19].

Providing substantial opportunities for students during their urology course could be seen as difficult due to the fact that genitourinary examination is particularly uncomfortable experience for patients. Medical students involvement in clinical tasks related to urology was found to share similar patient comfort levels and attitudes as involvement in family medicine, obstetrics/gynecology, general surgery, and pediatrics [20]. Kaplan *et al.* from University of California reported significant increase in comfort and ability to perform genitourinary examination and basic urological procedures by 3<sup>rd</sup> year students after short 5.5-hours course focused on practical skills. Students before this training were uncomfortable with procedures such as testicular examination, and only few percent had the chance to perform it [21]. In our study group, overall mean practical skills score was low, with most significant increase between 6<sup>th</sup> year students before and after urology course.

Main limitations of our study are survey design and non-validated questionnaire covering only selected areas of basic urological knowledge. Students' practical skills

were self-assessed and therefore not validated. Another limitation is data gathering in only one academic center. Study group was relatively small with particularly few students after completion of urological course, which probably is the reason for surprising prostate diseases scores ratio between 6<sup>th</sup> year students before and after urology course. Despite these limitations, we believe our study might provide valuable information concerning medical students' education in the field of urology and aid in revision of undergraduate medical education urological curriculum.

We believe that this study provides a useful insight into the current state of medical education in Poland. Presented results reveal low scores obtained after completing urology course (particularly knowledge concerning erectile dysfunction), which implies that urological knowledge among medical students in Poland might be insufficient and curriculum requires further development. This suggests a need for additional studies, conducted on a larger group of students in multiple universities, preferably with a validated questionnaire. Basic urological theoretical knowledge and self-reported practical skills assessed in the survey were improved with subsequent years of the undergraduate medical education. The urology course improved total test score, but mostly in general urological knowledge and self-assessed practical skills.

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### Authors' contribution

Oksana Skomarovska: distribution of surveys and acquisition of data, analysis and interpretation of data, drafting of the manuscript.

Tomasz Stefura: analysis and interpretation of data, drafting of the manuscript.

Karolina Kainka: distribution of surveys and acquisition of data.

Łukasz Radziszewski: distribution of surveys and acquisition of data.

Anna Katarzyna Czech: drafting of the manuscript and critical revision of the manuscript.

Katarzyna Gronostaj: critical revision of the manuscript.

Tadeusz Hessel: study design and critical revision of the manuscript.

Łukasz Curyło: critical revision of the manuscript.

Piotr L. Chłosta: study design and critical revision of the manuscript.

### Disclosure statement

The authors report no conflicts of interest.

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## Appendices

### Appendix 1. Questionnaire

1. Please mark year of medical studies that you are currently on:
  - a) 1
  - b) 2
  - c) 3
  - d) 4
  - e) 5
  - f) 6
2. Have you already completed your urology course?
  - a) Yes
  - b) No
3. Does urologist perform surgery?
  - a) Yes
  - b) No
4. Does urologist perform dialysis?
  - a) Yes
  - b) No
5. Does prostate and prostate gland are the same anatomical structure?\* (In Polish three different words are used to denominate prostate gland)
  - a) Yes
  - b) No
6. Is testicular cancer curable?
  - a) Yes
  - b) No
7. Does testicular cancer treatment include surgery?
  - a) Yes
  - b) No
8. Are you familiar with clinical term “overactive bladder”?
  - a) Yes
  - b) No
9. Are you familiar with the basic principles of urodynamic testing?
  - a) Yes
  - b) No
10. A 50-year-old female patient who noted blood in her urine one week ago during first appointment requires:
  - a) Urine cytology
  - b) Ultrasound examination of the bladder
  - c) Urinalysis

- d) Referral to an oncologist
  - e) Referral to a urologist
  - f) Referral to a gynecologist
11. A 50-year-old male patient who noted blood in his urine one week ago during first appointment requires:
- a) Urine cytology
  - b) Ultrasound examination of the bladder
  - c) Urinalysis
  - d) Referral to an oncologist
  - e) Referral to a urologist
  - f) Referral to an andrologist
12. Does patient with a lump on prostate gland during digital rectal examination require referral to urologist?
- a) Yes
  - b) No
13. Does patient with a firm and fixed prostate gland during digital rectal examination require referral to urologist?
- a) Yes
  - b) No
14. Is PSA blood test used as a screening test?
- a) Yes
  - b) No
15. A 50 years old male with PSA level = 1,5ng.ml, free/total PSA = 40%, and smooth, non-tender, non-enlarged mobile prostate gland visits you. His PSA level is:
- a) Normal
  - b) Requires oncological diagnostics
  - c) Suggests spreading of prostatic cancer
16. Patient from previous question requires:
- a) Ultrasound examination of the prostate gland
  - b) Urological consultation
  - c) Oncological consultation
  - d) PSA blood test in future
  - e) Immediate hospitalization
17. Do you agree that digital rectal examination is not necessary if PSA blood test is performed?
- a) Yes
  - b) No
18. Patient with prostate cancer, during hormone therapy is expected to experience:
- a) Hot flushes
  - b) Body mass gaining

- c) Erectile dysfunction
  - d) Decreased libido
  - e) Osteoporosis
  - f) Gynecomastia
19. 20 years old male with erectile dysfunction requires:
- a) Urinalysis
  - b) Referral to psychiatrist
  - c) Referral to psychologist
  - d) Referral to urologist
20. 50 years old male with erectile dysfunction requires:
- a) Urinalysis
  - b) Referral to psychiatrist
  - c) Referral to psychologist
  - d) Referral to urologist
21. What could be a causative factor of erectile dysfunction:
- a) Congenital anomalies of the genitourinary system
  - b) Hormonal disorders
  - c) Psychological disorders
  - d) Atherosclerosis
  - e) Diabetes mellitus
  - f) Drug side effects
22. Are you able to perform female bladder catheterization with a Foley catheter?
- a) Yes
  - b) No
23. Are you able to perform male bladder catheterization with a Foley catheter?
- a) Yes
  - b) No
24. Are you able to perform digital rectal examination?
- a) Yes
  - b) No
25. Are you able to perform testicular examination?
- a) Yes
  - b) No
26. Can you explain to a patient how to perform testicular self-examination?
- a) Yes
  - b) No
27. Do you know how self-catheterization is performed?
- a) Yes
  - b) No

28. In your opinion, does current medical school curriculum include sufficient amount of class hours dedicated to urology?
- a) Yes
  - b) No
29. Do you consider urology as a possible choice for your future career?
- a) Yes
  - b) No